Response to EVOS TC Science Panel FY14 Proposal Comments –
DRAFT 10-16-13

From: LTM Program Team Leads (Molly McCammon, Kris Holderied, Katrina Hoffman, and Tammy Neher)
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LONG-TERM MONITORING/GULF WATCH ALASKA AND HERRING PROPOSALS

*Both Programs are an overall Fund, with two conditional funds, as noted below

1. General Comments

Proposals were lacking in detail, hindering their evaluation. There was not enough information provided for the science panel to evaluate the proposals and offer substantive suggestions. In order to evaluate proposal merits, the science panel wanted to see more detail, including:

• Sampling design, locations and methods, including QA/QC of data collection
• Approach to data analysis including statistical methods and/or relevant contrasts
• Explicit statement of how analyses will answer the major questions
• A discussion of results to date and any adjustments in project design in view of results
• Explicit statement of how individual project results relate to or will be integrated into the broader program
• The proposals should be reviewed as a whole by someone from the group before submission.

The panel, EVOSTC and agency staff will be looking at options for providing brief guidance and/or a form for the programs in advance of proposal drafting and submission to clarify expectations. When EVOSTC staff has a draft form or guidance, we will circulate it to the Team Leads for their feedback. There was also initial discussion regarding reporting which we will also circulate if it is further developed.

LTM and HRM Program Team Lead Response:
We appreciate the detailed review from the EVOSTC Science Panel, and the interest in the ongoing program. We'd like to call your intention to the newly designed Gulf Watch Alaska website (www.gulfwatchalaska.org), designed by Eric Cline, developed by the AOOS team at Axiom Consulting and hosted by AOOS. It is still a "work in progress", but we anticipate it will be a valuable resource for the general public, the Trustee Council, and a variety of stakeholders.

We continue to work with the EVOSTC staff to refine reporting and annual proposal requirements, and our submissions have been made in accordance with the guidance we received. There seems to be a difference of opinion on what was

intended with the submitted materials. It appears the materials were reviewed as completely new proposals, rather than the third year work plans from the original, five-year approved programs. Many of the panel's comments were also specifically addressed in our original proposals, the Year 1 annual report and the recent 6-month report.

Several of the Science Panel's comments recommend substantial changes to the previously approved programs. We understand that there are a number of new panel members, and suggest that the Science Panel and the LTM and HRM Programs could mutually benefit by establishing a dialogue between panel members and the program science leads, perhaps through a joint webinar/teleconference meeting that might include some of the project PIs called out in subsequent comments.

Some of the specific issues described by the panel arise because of the program teams' need to report – within a defined page limit - on an integrated program with multiple projects, and the panel's desire to have greater detail on individual projects. Those familiar with the history of the Trustee Council's request for proposals for integrated programs are also familiar with our challenges in creating an integrated program composed of a set of long-standing individual projects with limited funding. Therefore, our report summaries focus on the overall program with individual project details provided in the investigator project summaries. We look forward to finding ways to communicate information in a way that fosters integration and synthesis across the program.

In response to specific issues raised:
a. <u>Sampling design, locations and methods, including QA/QC</u>. Documented sampling protocols are required by all program PIs and are available in a folder on the Gulf Watch Alaska Research Workspace coordinated by Axiom Consulting. Any changes to these protocols must be approved by the Program Management Team and Science Coordinating Committee. We do not have the financial resources to conduct an in-depth review of each protocol nor to provide additional QA/QC for every dataset beyond what is done by the investigators. Since this program is highly leveraged, and depends on monitoring assets supported by multiple federal and state agencies and university partners, we depend on these entities to ensure adequate instrument calibration and data QA/QC, and to document these procedures in the sampling protocols and metadata. We can make these protocols available to the Science Panel if desired. In addition, our science coordinator, Dr. Tammy Neher, reviews and coordinates metadata and data formats at the overall program level.

b. <u>Approach to data analysis including statistical methods and/or relevant contrasts</u>. Detailed statistical analyses vary for each project to address the specific time series, and several of the program scientists have completed or have publications in press that address their analytical approaches (examples include Weingartner, Bishop, and Matkin). We would appreciate clarification from the Science Panel if they are referring to particular analyses with this comment, as data analysis approaches are

discussed within the detailed project descriptions. We can then include additional details on data analysis approaches in our year 2 annual report.

c. Explicit statement of how analyses will answer the major questions. One planned topic of our annual Gulf Watch Alaska PI meeting in November 2013 is to discuss all the research questions listed in our original proposal and review preparation of initial results for the February 2015 joint Science Workshop and a journal special issue following the workshop. We can provide that information and a summary of the analytical approaches in our year 2 annual report. We also note that the goals of the Gulf Watch Alaska ecosystem monitoring program are not limited to providing information to address these research questions. These questions were selected to identify some, but not all, of the issues that could be addressed by the Trustee Council's long-term monitoring program. By collecting and providing data to the science community, our goal is also to facilitate significantly more Gulf of Alaska research than can be accomplished within the funding levels of this program alone.

d. Discussion of results to date and any adjustments in project design in view of results. The program is designed as a long-term monitoring program and is in its second year of data collection. The annual and 6-month reports include more detailed descriptions of results to date and adjustments in project design. The Piatt and Arimitsu forage fish project is one example where the project design has been modified based on initial results. We will work with the EVOSTC staff and Science Panel to refine report formats in order to provide the level of detail desired by the Science Panel and to provide our PIs with clear guidance for their report input.

e. Explicit statement of how individual project results relate to or will be integrated into the broader program. Project integration is discussed in our original 5-year proposal, in the Coordination and Collaboration sections for each individual project in the Year 3 work plan submission, and in our annual and 6-month reports. As discussed in the semi-annual report, we are beginning the integration process through the expert opinion-weighted conceptual model development process. We will add to this process through the November 2013 time series workshop that includes a pattern analysis and discussion using trend cards. The products of these two efforts will be used to help inform the synthesis process. We agree that this is an important topic and recommend that the Science Panel and LTM and HRM program team leads discuss this in the near future.

f. Overall review of proposals. The entire package was reviewed by the Program Management Team (program lead, science lead, science coordinator, and administrative lead). We agree that there is still "unevenness" in the depth of information provided in the individual components and look forward to working with EVOSTC staff and Science Panel to refine work plan and report format and content.

2. Physical Oceanography concerns

An overall review by an outside expert in physical oceanography and climate would be useful. In the current round of proposals, the need to describe physical oceanographic forcing was rarely described. Several proposals generally provided vague language, in some cases they cut and pasted text from the overarching and original 2012 proposal.

There is uneven treatment and an apparent lack of collaboration among the four oceanography projects in LTM. The Weingartner (GAK1) and Hopcroft (Seward Line) proposals are well thought out and collaborative. However, Campbell and Doroff proposals should be more collaborative and thorough, including physical measurements; they are also unclear on instrument calibration and data QA/QC. There is no evidence of collaboration with trained physical oceanographers or reference to the PWS sampling stations in the Hopcroft proposal. An overall review of the physical oceanography and climate aspects of LTM (and, to a lesser extent, herring) would be useful.

Outside expert for oceanography review - some suggestions for trained oceanographers who work with biologists include: John Largier, UC Davis/Bodega Marine Laboratory, Steven Bogard, SWFSC-NMFS, and Jack Barth, OSU.

LTM Program Team Lead Response:
While we welcome additional collaborations with other physical oceanography experts, we believe that our program is being well served by the existing investigators. Dr. Weingartner and Dr. Hopcroft serve on the GWA Science Coordinating Committee as leads for the Environmental Drivers component and bring extensive physical oceanography experience to that leadership role. Dr. Campbell (Prince William Sound oceanography project) has considerable experience with cross-disciplinary (physical oceanography and biological) marine research, instrumentation, and instrument calibration. Ms. Holderied (Cook Inlet oceanography project) also is a coastal physical oceanographer. Ms. Doroff (Cook Inlet oceanography project) is the research coordinator for the Kachemak Bay National Estuarine Research Reserve, oversees an extensive long-term water quality monitoring program in Kachemak Bay, is the PI on a project to validate ocean circulation models for the Reserve, and is skilled in communicating science to coastal decision-makers. The GWA team also works closely with Dr. Pegau of the HRM program, who is an experienced physical oceanographer. All GWA PIs interact with each other regularly, and at a minimum via quarterly PI teleconferences, email, an annual PI meeting, and the annual Alaska Marine Science Symposium. In addition to these contacts, team members add additional value to the program through their contacts and collaborations with numerous other programs funded by other entities.

The Year 3 work plan project submissions for the physical oceanography part of the Environmental Drivers component (GAK1 mooring, Seward Line, Prince William Sound, Cook Inlet) did not propose significant changes from the original sampling plan of the 5-year Gulf Watch Alaska program. We followed guidance from Trustee

Council staff prohibiting us from proposing any work that required additional funding from what had been approved for the 5-year program. We did include text from the original proposal for background, but did not completely repeat the original proposal language or information included in the annual and 6-month reports.

The Environmental Drivers component, which also includes Dr. Batten's Continuous Plankton Recorder measurements, was designed to capture seasonal and interannual oceanographic patterns in the major estuaries of Prince William Sound and lower Cook Inlet, as well as across the Gulf of Alaska shelf. The program builds on existing oceanographic time series in all regions, collectively provides information to assess linkages in shelf-estuary conditions, and provides environmental data for investigators in the Benthic and Pelagic monitoring components. We have ongoing collaboration between several of the Environmental Drivers projects, as well as with other component projects, as described in the "Coordination and Collaboration" sections of the proposed work plan and the annual and 6-month reports. A coordinated review of the physical oceanographic (and other) time series data is already part of the agenda for the November 2013 PI meeting and will also be a part of the preparatory work for the February 2015 joint Science Workshop with the HRM program. As mentioned above, all of our projects have sampling protocols that address QA/QC, including instrument calibration. The sampling protocols are maintained on the GWA Research Workspace and can be made available to the Science Panel.

3. Publications

The science panel encourages investigators to publish their results in peer-reviewed journals to make their hard-won results available to wider scientific audience. This encouragement especially applies to young investigators who are establishing their careers. They may quickly become unable to compete for other jobs. We anticipate the FY17 Invitation will include an expectation to publish.

LTM and HRM Program Team Lead Response
We agree with the recommendation to publish results in peer-reviewed journals, and have included references in our reports to several publications already in process. In addition, we have started to work with PIs to develop materials for a special journal issue, which will also support science synthesis efforts prior to the 2015 workshop.

4. Data Management

The science panel is concerned about progress on data management. The data management proposal drew heavily on their old proposal without including sufficient updated evidence of interactions between the programs' PIs and the data management team. In addition, there does not appear to be a data management policy or QA/QC policy created as the programs approach Year Three. In addition,

no milestones were reported in the newly submitted proposals, so it was difficult to gauge how much progress had been made in the last two years. Moreover, it was not clear how data would be available for synthesis. The panel recommends that the Council condition funding upon the creation of a credible and detailed data management policy and a QA/QC policy and include clear milestones in for their proposal.

Regarding a QA/QC policy: such a document is a basic need of any data management. We note too that instruments commonly need to be calibrated before and after use to be able to adjust for measurement drift, if it occurs. With two separate data centers operating under the EVOSTC program it is crucial that a high level of QA/QC be maintained. The Science Panel is concerned that adequate attention is not being devoted to this fundamental aspect of data management. It is particularly important that to assemble complete metadata to ensure that long-term data sets can be verified and understood once the current participants have moved on to new positions. For example, EPA and NSF require detailed data management and QA/QC plans as part of all proposals. Large monitoring programs, such as NSF's LTER and oceanographic programs, devote considerable time and effort to addressing these critical needs.

Example: As a specific example, the Ocean Tracking Network (OTN) has four nearly full-time people creating metadata forms that are required to be filled out, submitted and checked for QA-QC before data can be added to the database. Since OTN is currently adding equipment to tracking arrays in PWS, it would be particularly appropriate at this time to arrange communication between senior OTN data managers with EVOSTC program data PIs to ensure that data standards are adequate. As with OTN, and as emphasized in the initial funding of the EVOSTC programs, skilled data management resulting in data that can be relied upon by the scientific community and resource agencies will ultimately determine the long-term success and influence of the programs. The contact at OTN is Bob Branton (bob.branton@gmail.com) or (bob.branton@dal.ca).

LTM and HRM Program Team Lead Response:
As mentioned above, all of the GWA projects have sampling protocols that address QA/QC, including instrument calibration. The sampling protocols are maintained on the GWA's Research Workspace account. In addition, all PIs were required to sign a Program Management Plan, which included a detailed Data Management and Public Access Policy. That policy was developed after review of a multitude of data policies for programs such as GLOBEC, NSF LTERs, NCEAS, North Pacific Research Board's Bering Sea and Gulf of Alaska Integrated Research Programs, PISCO, ORNL (NASA), and TEAM Network.

Because of limited funding for data management services in this proposal (about 7% of total budget), the Program Management Team and Science Coordinating Committee adopted an approach that provide tools for PIs to assist with managing their data themselves. These tools include assistance with writing metadata in ways

that follow national standards, and use of the Research Workspace to provide greater data and information access to the entire program team for use in synthesis and analysis activities. We would greatly appreciate more funding and staff to devote to this effort, but the entire program has been encouraged to work within the existing budget limits.

Our approach has been to leverage the resources of the Alaska Ocean Observing System's data management system, which is the only one of its kind with the mission of serving as a regional data assembly center and archive for Alaska ocean and coastal data and information products. All PIs submit their data annually to a private, password-protected GWA account on the AOOS Research Workspace. That data is then available for all program members to access and use for synthesis and analysis activities. At agreed upon times, the most current, QA/QC'd data are "published" from this site into the publicly accessible Gulf of Alaska portion of the AOOS Ocean Portal. We are also developing an automated means to publish this data to a DataONE node and to NOAA's National Oceanographic Data Center.

As with most research and monitoring programs, we have had challenges changing the culture from individuals holding on to their own data on personal computers, to one of more open access and sharing. However, we are making progress, and the investigators see the value in doing so. We have already started making data publicly available and are actively working with our PIs, science coordinator, NCEAS and data management team to further streamline processes for internal data sharing and public access.

We have worked closely with Trustee Council staff regarding annual proposals and reports, and submitted only detail to indicate if there were any major deviations from the approach described in the approved 5-year proposal. However, we realize that the Science Panel would like more detail relating to data management and have provided that detail in two attached documents: Appendix A: LTM Program Data Management Plan (a compilation in one document of text included in the original 5 year approved proposal, reports, the Program Management Plan, and other additional explanatory information) and Appendix B: LTM Program Data Management Services Progress to Date report, which includes attached lists of all the data acquired to date. Please let us know if you would like any additional detail.

5. Attrition of Experienced Personnel

The panel notes that it may be a challenge to replace experienced personnel retiring or transitioning out of the programs, but the need for their expertise remains. To address these changes, the panel suggests that the programs partner their junior PIs with newly recruited, experienced scientists. Where difficulties exist in filling key positions, the panel also suggests strategically tapping outside experts to review projects and provide consultation and setting up a Post-Doc training program for the LTM and Herring projects. As experienced personnel leave the program either through retirement or departure, the salary savings could fund this kind of activity.

Potential Resource - The panel encourages the programs to consider options for developing concepts for postdoctoral programs that can help address these issues. The panel and the programs' internal panels and advisory groups can provide assistance in identifying potential post doc candidates who may be helpful to the programs. Intergovernmental Personnel Assignments and perhaps NRC Research Associate post-docs may also be a source for additional expertise and post-doc work.

LTM and HRM Program Team Lead Response:
We agree on the potential side benefit of long-term research and monitoring programs to provide training opportunities for junior scientists. We have actively encouraged such efforts from the beginning of the program and have a large group of young scientists already working in both programs. Training replacements has focused on those projects where we expect to lose key investigators in the near future. It is not practical to train post-docs in every project to ensure replacements of unexpected losses. However, we would be open to discussing this further with the Science Panel and Trustee Council staff if additional resources are available.

6. Synthesis in Advance of February 2015 Workshop

There is concern from our review of the proposals that the programs are postponing work on synthesis until just before the Workshop. The programs should think through and create a step-by-step route and design for their 2015 synthesis so there is sufficient field time to work on it. This plan should include mechanisms and process. The part of synthesis that involves creation of and testing of models is best done by an iterative process in which modeling is sequentially tested by reference to new data and the models revised accordingly. There was also a suggestion to focus on cross-cutting topical issues, such as acoustics and calibration. PIs with different expertise could be paired to initiate and encourage actual synthetic analyses and presentation in contrast to single PI presentations on isolated projects or topics. Examples for pairings include: disease and physiology, and modeling of herring movements and disease.

LTM Program Team Lead Response: We agree with the Science Panel on the need for advance preparation for the joint Science Workshop. Synthesis-related efforts have been underway since Year 1 of the GWA program, with initial efforts reported in the annual and 6-month reports (Holderied, project 13120114-H and historical data compilation in Jones, project 13120120). As an early tool to promote cross-cutting analyses, the November 2012 PI meeting included cross-disciplinary break-out groups of investigators to assess components for Gulf of Alaska conceptual ecological models (see Conceptual Ecological Modeling project comments for more details). The GWA program has planned a focused, inter-disciplinary time series analysis work session during the upcoming annual PI meeting in November 2013, with an emphasis on coordination for potential scientific journal publications and preparation for the February 2015 Science Workshop. We are inviting scientists from other programs to join in the November work session, including individuals

from the HRM program, the North Pacific Research Board's Gulf of Alaska Integrated Ecosystem Research Program, Alaska Department of Fish and Game, and the NOAA National Weather Service. The GWA program team leads believe that the programs would benefit from additional coordination with the Science Panel in advance of the February 2015 Science Workshop and would appreciate a discussion with Trustee Council staff on options for such coordination.

The HRM program is already benefiting from a synthesis submitted in May 2013 regarding the first year of life of herring. This allows the program to build upon that effort in the iterative manner suggested. The potential synthesis topics suggested by the Science Panel are intriguing, but we are limited by the information available and may not have the correct type of information to answer these particular questions. We will examine them more closely to further assess what is feasible.

7. LTM/Gulf Watch Alaska Program 14120114

The science panel appreciates the general approach of the LTM program but feels that more basic information was needed to fully evaluate the potential success of the program. The discussion below includes several projects that are highlighted as examples that would have benefitted from the inclusion of additional information for developing more informative proposals and progress reports. The panel looks for more informative proposals and progress reports in the future. Our goal is to provide feedback that may strengthen the program while it is still in its formative stage of implementation.

*Proposals by Matkin on killer whales, Rice on humpback whales, and Lindeman on benthic monitoring were all praised by the Science Panel for their importance, inclusion of detail, and significant progress.

LTM Program Team Lead Response:
We agree that the GWA program would benefit from additional discussion with the Science Panel and look forward to those discussions. Please also see comments under #1 above. We also appreciate the positive comments on particular report contents from the Science Panel. Please note that the PIs for the humpback whale project are Dr. Straley and Dr. Moran, not Rice. Dr. Rice retired last year, as reported in our March 2013 annual report, and Dr. Lindeberg is the new Pelagic (not Benthic) component lead. Dr. Lindeberg is collaborating with the Benthic group, but Ballachey is the component lead and project lead for project 13120114-R. Drs. Konar and Iken are project leads for Benthic Monitoring project 13120114-L.

8. Program Science Panel and Upcoming 2015 Synthesis

*See also Synthesis in Advance of February 2015 Workshop, above.

Proposal Objective 2. Assist with Scientific Review Panel: "Setup of the panel has been delayed in order to make the most effective use of panel members' time in

advance of the synthesis workshop. Planning of the synthesis workshop begins in the final two quarters of year 2; the panel will be established by the end of year two (approximately one year in advance of the synthesis workshop)."

This is a major problem. Bringing an outside science review into projects makes changes difficult (because of already established long-term monitoring protocols). Some of these aspects should have been established in Year 1 rather than just before a major synthesis workshop in Year 3. The science panel suggests they establish a group that reviews the developed monitoring and integration plans and how they support synthesis.

Regarding the Program's Science Panel: What is its status? Their influence and guidance is not apparent; guidance, integration is needed. The LTM Program's internal science panel should be already composed, constituted and advising by now.

LTM Program Team Lead Response:
The internal Science Coordinating Committee was established at the beginning of the GWA program and has helped coordinate and advise the program from the beginning, as described in program reports and work plans. The timing of the establishment of the external GWA Science Review panel was discussed in detail with the Program Management Team, Science Coordinating Committee, Trustee Council staff and other integrated research program leads. The joint decision was to optimize use of valuable review panel member time at a time when program assessment is most needed, which is leading up to and following the joint Science Workshop in 2015. We anticipate a significant time commitment by the external panel, made up of volunteers, over at least a two year period. We did not expect, and were advised by Council staff not to propose, significant changes to the sampling program during the first 5-year phase of GWA, especially in the first 2 years. Therefore we plan to establish the external Science Review panel before the end of year 2 of the program (February 2014).

The GWA and HRM program leads are concerned that several Science Panel comments indicate potential recommendations for significant changes to GWA monitoring efforts during the current 5-year phase of the GWA program. The program intentionally builds on long-term monitoring efforts funded by the EVOS Trustee Council and other agencies over the past 2 decades. Some adjustments are being made to monitoring programs based on initial results (e.g., forage fish monitoring in PWS, additional coordination of benthic sampling protocols between regions), but we do not anticipate major changes during this 5-year period. If the panel recommends otherwise, that will require additional discussion. We anticipate that the review of the monitoring program and data syntheses planned for the joint Science Workshop will primarily be used to inform planning for the next 5-year phase of the GWA program.

9. Bochenek. Data Management 14120114-D *CONDITIONAL FUND

*See Data Management, above and below, in Herring Program.

LTM Program Team Lead Response: See comments to #4 above.

10. Bishop. Gulfwatch long-term monitoring pelagic component - Long-term monitoring of seabird abundance and habitat associations during late fall and winter in Prince William Sound 14120114-C

The proposed objectives are to characterize the spatial and temporal distribution of seabirds in PWS during late fall and winter and relate the presence of seabirds with prey distributions from hydro-acoustic surveys for identifying winter habitat of seabirds and improving estimates of herring consumption in winter. The panel feels that improved resolution of sampling during summer, when seabirds are nesting and most accurately censused, may be more fruitful than conducting expansive surveys during the winter. Given the overlap of investigators on the summer and winter surveys, we encourage them to consider conducting annual rather than biannual surveys in summer by scaling back winter surveys.

LTM Program Team Lead Response:
We need clarification on the recommendation on seabird surveys, since the Science Panel comments appear to recommend combining two different surveys, one under the Pelagic component (Bishop, 14120114-C) and one under the Benthic component (Kuletz and Irons, 13120114-K). The Bishop project is specifically designed to collect information in late fall and winter to complement other summer seabird monitoring efforts. The Bishop project is also conducted cost-effectively in conjunction with HRM and GWA humpback whale surveys and leverages vessel time provided by those projects. Conducting additional summer surveys under the Kuletz and Irons project would require significantly more funding from the Trustee Council. In addition, as part of the first 5-year phase, we are evaluating our sampling design, both through individual projects (e.g. Coletti, 13120114-F on evaluation of nearshore bird surveys), and in preparation for the 2015 joint Science Workshop.

11. Campbell. Long term monitoring of oceanographic conditions in Prince William Sound 14120114-E

The physical measurements are very important in a project of this kind. There is little evidence that the nuances of the physical oceanography – from instrument calibration, data QA, interpretation of results, and relationships to other similar programs – are in place. There is no reference to or integration with the UA (University of Alaska) physical oceanographers from the Gulf Watch Alaska (GAK1) program or to the physical measurements being made in PWS in the Seward Line program, or the historical physical oceanography conducted by the PWSSC that describes water mass movements from the shelf into Hinchinbrook Entrance and through PWS.

For the moored instrument, calibration is a concern. The proposal states that instruments will be calibrated annually. Typically they should be calibrated before and after each deployment, and the data corrected for drift of the instruments. Has a physical oceanographer been consulted on this? The concern is that the physical data will be assumed to be accurate and will be used for various purposes without adequate QA/QC.

There is not a lot of specificity on how the plankton will be handled, net sizes or other factors. Need further information on target species, and it would be good to show how this relates to Hopcroft's Seward line project, particularly those EVOSTC funded samples taken in PWS, and to Batten's continuous plankton recorder results. There is no evidence of this in the Collaboration and Cooperation section of the proposal.

LTM Program Team Lead Response: As mentioned previously, Dr. Campbell (Prince William Sound oceanography project) has considerable experience with cross-disciplinary (physical oceanography and biological) marine research, instrumentation, and instrument calibration. Details about how plankton are handled, net sizes, and other factors are in the original proposal as well as Dr. Campbell's sampling protocol.

All GWA PIs interact with each other at minimum via quarterly PI teleconferences, email, and an annual PI meeting. PIs such as Dr. Campbell who called out collaborations with parties external to GWA in their work plans did so to emphasize relationships leveraged by GWA. Interactions between and among GWA PIs occur with regularity, as does contact between Dr. Campbell and physical oceanographers both at UA and other institutes. Dr. Campbell is not only highly aware of historic PWSSC oceanographic data collection efforts, but he regularly works with the data collected during those projects.

12. Carls & Lindeberg. Long-term Monitoring: Lingering Oil - Extending the Tracking of oil levels and weathering (PAH composition) in PWS through time 14120114-S

This is one of the few projects presenting data, and it was "refreshing." The hydrocarbon database is important to assess environmental damage in the event of another oil spill, and it may be still relevant to biological assessments of long-term oil impacts and perhaps to re-opener disputes. The PI's indicate that there are not enough funds for complete updating and QA/QC of the database with 1-person/yr effort. If so, arrangements should be made to correct this oversight. If the solution is to request additional funds, then a detailed supplemental proposal should fully justify this request. In general, the science panel requests that fundamental information on the numbers and locations of sampling (both site and tidal elevation) be included in future project proposals and reports to more fully evaluate them.

LTM Program Team Lead Response:
The Science Panel comment indicates that they found the presentation of historical data useful in the work plan proposal as no new data has yet been collected under this project. We suggest this topic be included in a discussion between the GWA leads, Trustee Council staff and Science Panel on format for program reports and work plan submissions. The hydrocarbon database is maintained primarily as an in-kind contribution by the NOAA National Marine Fisheries Service, Auke Bay Laboratory, but could be significantly improved with additional funding. We can submit a detailed supplemental proposal if requested by Trustee Council staff and if additional funds are available. As detailed in the year 3 work plan proposal, the FY 2014 effort in this project will include determination of the specific sites to be sampled in 2015. The site determination will be based, at a minimum, on mussel bed time series started in the early 1990s, beach surveys that were continued up to 2004, and spatial modeling analysis that was initiated in 2008. Regarding the lingering oil surveys, site selection is determined randomly with replacement, in a stratified design based on the degree of initial oiling of shore segments (heavy, moderate, and light oiling). Tidal elevation for these surveys initially ranged from MHHW to +3m but was subsequently expanded to the zero tide line when oil was discovered below the expected threshold. Detailed information on the sampling sites and tidal elevation will be provided when available.

13. Doroff. Long-term monitoring of oceanographic conditions in Cook Inlet/Kachemak Bay to understand recovery and restoration of injured near-shore species 14120114-G

The Science Panel agrees that mapping the waters of lower Cook Inlet and Kachemak Bay to understand the effects of intrusions of the Alaska Coastal Current and variation of other currents on phytoplankton and zooplankton distribution and abundance is a valuable part of long-term ecosystem monitoring. Questions arose about the ability to meet this objective with the proposed unbalanced sampling design. Sampling transects 3, 4, 6, and 7 (Kachemak Bay and lower Cook Inlet) will be reduced from quarterly in the first three years of the project to three times in Y4 and twice in Y5 due to budget constraints, thereby limiting the scope of analysis among years. Would a different, but inter-annually consistent, design provide a more powerful, thorough, and rigorous analysis of temporal and spatial variation under these budget constraints? Alternatives might include reducing the: (1) sampling frequency of transects to three times per year throughout the study, (2) the number of stations along transects to maintain quarterly sampling or (3) the number of transects to maintain quarterly sampling. We advise that this sampling plan be carefully re-evaluated and justified.

Concerns were also expressed about the collection and handling of physical measurements – are instruments appropriately calibrated, and how are data handled (QA/QC)? Evidence of collaboration with other physical measurement programs (GAK1, Seward Line) and the relationship to (and use of?) the results of the new Seward Line PWS stations were of interest. Are the physical oceanography

measurements in the program designed to take into account the gyre and counter-gyre in Kachemak Bay?

LTM Program Team Lead Response:
We are near the end of Year 2 of the 5-year program, with vessel contracts established through June 2014, and therefore cannot change the sampling design as suggested by the Science Panel, since much of the quarterly sampling has already been accomplished. We agree that it would be preferable to continue quarterly sampling in years 4 and 5 and have leveraged funding from other sources to be able to accomplish more sampling in years 4 and 5 than was originally proposed, while not increasing the requested funding. We reduced the sampling plan to fit within the overall budget limit for the program and still accomplish our primary goals. We decided to conduct quarterly sampling in lower Cook Inlet (in addition to monthly sampling in Kachemak Bay) in the first 3 years to improve assessment of seasonal variability, particularly of fall and winter conditions. We considered conducting less frequent sampling during the year to maintain consistency over 5 years, but determined that collecting data to assess seasonal variability was an important information gap to fill, particularly as we are interested in shelf-estuary exchange (in collaboration with Weingartner and Hopcroft Gulf of Alaska projects), in regional comparisons with Prince William Sound conditions (in collaboration with Campbell project) and in providing environmental data for the Benthic Monitoring efforts (Konar and Iken project) and for harmful algal bloom and ocean acidification research (separate NOAA and ADFG studies). We are fortunate to have captured a range of different forcing conditions (near record versus normal snow pack and normal summer precipitation/temperature versus dry/warm summer conditions) in the first 2 years of the project.

The monthly small boat sampling is maintained for all 5 years. While reducing the number of stations along each transect would not substantially reduce the vessel charter costs (due to length of time to conduct transects and relatively short time for CTD casts alone), we have also evaluated that option. However our initial data results demonstrate that current station spacing is needed to capture the strong horizontal gradients in Cook Inlet oceanographic conditions, particularly as those gradients are important for plankton, marine birds and other species.

As described in the original proposal and year 3 work plan, data QA/QC and instrument calibration for the water quality station instruments is conducted in accordance with the National Estuarine Research Reserve System-wide Monitoring Program, including a secondary review by the national NERR program's Central Data Management office. Additional information on water quality monitoring QA/QC can be found at http://cdmo.baruch.sc.edu/data/qaqc.cfm for Kachemak Bay. For conductivity-temperature-depth (CTD) profiler data, in addition to the processing steps described in the work plan, the final data formats are being coordinated with the data management team for consistency across the different oceanography projects. The Seabird Electronics 19plus profilers are sent to Seabird

Electronics annually for sensor calibration. Additional information on calibration and data QA/QC for the oceanographic data is also available in the project's sampling protocol. The zooplankton data is collected using the same protocols as in the Campbell Prince William Sound project, and Campbell is conducting zooplankton identification and data processing.

As described in the Environmental Drivers overview in the original proposal and referenced in the year 3 work plan, the analysis of data from the first 2.5 years of this project, along with previous oceanographic sampling along the same transects, will be used in conjunction with data from the GAK1, Seward Line, and Prince William Sound oceanography projects to assess temporal and spatial variability in oceanographic conditions. The sampling design was planned to be complementary with the other projects and to build off previous Cook Inlet oceanographic sampling to create longer time series. We are looking forward to discussing results of the first 18 months of sampling in this project with our colleagues at the November 2013 PI meeting and planning synthesis efforts in the coming year. We would also welcome an expanded discussion with Science Panel members who are interested in GWA oceanographic monitoring.

The Science Panel comments refer to the outer Kachemak Bay gyre and counter-gyre identified as potential subtidal circulation patterns by Burbank (1977), which is one of the reasons for sampling along Transect 4 in outer Kachemak Bay. While the GWA project is not funded to measure currents, Doroff and Holderied are involved in separately funded research to deploy drifter buoys in Kachemak Bay and develop an operational National Ocean Service ocean circulation model for Cook Inlet and Kachemak Bay. Those ocean circulation studies will provide new information on Cook Inlet tidal and subtidal circulation patterns and are an example of how we are leveraging other funding to enhance the GWA program.

14. Hollmen. Synthesis and Conceptual Ecological Modeling 14120114-I: *CONDITIONAL FUND

From the CV, there is no evidence that the PI has experience as a synthetic ecological modeler. Her CV and publications suggest that she is more of an avian physiologist. It is unclear how their web-based visualization and data exploration tools differ from those of the data management group and NCEAS. Is there unnecessary duplication? Also, it appears that there are no plans to achieve the objectives until the very end of the 5-yr program. This is not acceptable, as it leaves inadequate time for iterative model evaluation and refinement.

This modeling project is very important to the overall program. However, it lacks evidence of any progress two years into the project and offers no vision of what can and will be done. No milestones have been tied to ongoing costs for this project. The proposals include an integration component but the submissions were boilerplate. More explicit information that sets out a road map is needed, not necessarily a longer submission. The programs are focused on monitoring but the programs

should still have forward-thinking research. There should also be an adaptive process that allows the programs to set out a conceptual model, which is continuously updated and refined as its accuracy is challenged by new data and the PIs should develop a collection of reasonable hypotheses.

To address these problems, the panel recommends the formation of a Conceptual Modeling Group, drawn from the programs' existing PIs who are already involved in the programs and known for their synthetic vision: Piatt, Pegau, Weingartner, Hopcroft and Jeep Rice. Examples of synthesis can be found on the Internet, including Chesapeake Bay, George's Bank and Steve Brandt's spatially explicit modeling of habitat quality and fish growth. Daniel Pauly and Tom Okey have been involved in an ECOPATH-ECOISM modeling of the PWS food web.

LTM Program Team Lead Response:
The development of conceptual models to support the synthesis of Gulf Watch Alaska program was initiated 1.5 years ago. The core team working on the modeling task consists of project PI Dr. Tuula Hollmen and collaborator Dr. Suresh Sethi. Dr Hollmen has background and expertise in marine ecology and in decision analysis for resource management, specifically in the development of decision support tools and application of models for natural resource management and monitoring programs. Dr Sethi brings expertise in biometry, applied statistics, and modeling for marine ecosystems and resource management.

The overall goals of the conceptual modeling effort are to develop a conceptual ecological model of the North Gulf of Alaska for the Gulf Watch program that will be used: 1) to represent the current state of knowledge of the North Gulf of Alaska ecosystem to support synthesis of Gulf Watch program efforts; 2) as an iterative tool to demonstrate progress of knowledge throughout the program and learning contributions from the Gulf Watch program; and 3) as a communication tool among scientists, stakeholders, and the general public. Our plan is to accomplish the first conceptual ecosystem model by March 2014, and iteratively update and refine the model throughout the program. The final model will be a product of iterative updates, reflecting ongoing learning from program results. The conceptual models also will provide visualization tools for outreach and education, in coordination with the program's Outreach and Community Involvement Committee. That committee will help to coordinate efforts among modeling, data management, and NCEAS projects to facilitate complementary education efforts and avoid any duplication of effort.

Additional detail is provided as a separate attachment: Appendix C: LTM Hollmen. Synthesis and Conceptual Ecological Modeling 14120114-I, Progress to Date.

15. Kuletz. Continuing the Legacy: Prince William Sound Marine Bird Population Trends 14120114-K

The science panel agrees that continuing the long-term monitoring of marine birds in Prince William Sound (since 1989) is important, given that some species (pigeon guillemots and marbled murrelets) are still declining in oiled areas. We also agree that the high inter-annual variation in numbers of some bird species is problematic, and hence, we question whether maintaining biennial sampling is sufficient to detect trends in recovery. Annual sampling may be needed to better couple variation in bird abundances with ocean conditions, and thereby improve our understanding of factors affecting the recovery of bird populations in PWS; however, it also would increase the budget substantially.

In light of this, we recommend that the PIs review the purpose and goals of sampling and that the sampling frequency be carefully reconsidered, in part by using a power analysis of impacts of alternative survey frequencies.

LTM Program Team Lead Response:
The GWA team agrees that annual sampling would be preferred, but that is not feasible under the current program funding level. Regarding evaluation of the sampling design, we note that the GWA program includes a project (Coletti, 13120114-F) that will analyze historical marine bird survey data to assess the ability to detect trends in nearshore marine bird populations under a variety of survey time frames. The analysis will use over 10 years of historical survey data taken in Prince William Sound since the mid-1990s. The project has been delayed, but is expected to be complete in the summer of 2014 and the results will be used to inform GWA program decisions to recommend alternate marine bird survey frequencies to the Trustee Council.

16. McCammon. Outreach and Community Involvement 14120114-B

This proposal demonstrates a good range of activities, and it is well written and explained. It provides very good elaboration on the level of partnering and how partnerships work. The project has good advisory committees, but could use some evaluation of the impacts of its public educational programs, such as whether they are reaching the intended audience, etc. The budget may be inadequate to support such evaluation costs.

LTM Program Team Lead Response: We agree that evaluation of impacts would be beneficial, and are looking to incorporate in the upcoming year some of the low-cost evaluation tools developed by the COSEE Alaska program. In addition, please visit www.gulfwatchalaska.org, the evolving public website for the program.

Herring Program 14120111

17. Herring Program Advisory Group, academic position suggestion: Some additional expertise that could assist with this group are Tim Essington (UW) and

Alec McCall, SWFSC would also be a good choice for membership. *See also Attrition of Experienced Personnel, above.

HRM Program Team Lead Response:
Thank you very much for the suggestions. Dr. Pegau has been trying to identify a person to replace Ted Cooney on that group. That group includes personnel from NOAA, ADF&G, academia, and hopefully the fishing community. They have been invited to be part of the PI meetings, but need to be more active in reviewing the state of the program now that we are starting to see results and think about next steps.

18. Defining program priorities

There is a basic requirement of the herring program to develop a credible and defensible program/project to assess herring abundance. In practice this means the implementation of a modern stock assessment model. This requirement supersedes all others because virtually all other projects in the herring program, and some in the Gulf Watch program, are dependent on the confidence levels associated with the herring assessments. Such assessment is essential even in the absence of any commercial fishery of in Prince William Sound, because herring abundance will impact so much of the ecology of other species.

Stock assessments usually are done by an agency, such as ADFG, but because of the importance of herring it is reasonable for other experts to develop a state-of-the-art age-structured stock assessment (ASA) model tailored for PWS herring, perhaps to be done cooperatively with ADFG. From the proposals this seems to be happening, but, in the opinion of the science panel, not rapidly enough. The concern with delay is that it will be difficult to fully appreciate many of the ecological processes of Prince William Sound unless there is a reasonable understanding of the abundance of herring. In other worlds, the scientific value of nearly all of the herring projects depends partly on the reliability of the herring assessments.

Typically, an age-structure-assessment (ASA) model requires a 'tuner' or an independent dataset that provides a time-series index of abundance (i.e., to tune the model). For PWS herring there may be only two options: a time series of (i) spawn data or (ii) acoustic data. The problem is complex, because the time series of these two datasets are of differing length. Perhaps there are other data options, but the modelers need to ensure that they understand the strengths and limitations of all the data they use in the model. This is a task that requires experience.

It is important to note that, while acoustic estimates of abundance of herring are commonly used around the world, they seldom are used as stand-alone independent measures of biomass. Instead, they usually contribute time-series data to more complex models that incorporate age structure data and other information. If the available time series data (from spawn or acoustics) are not suitable for an ASA

model, then other assessment models or approaches must be considered – and presumably this could involve acoustic approaches, or even simple models based mainly on spawn abundance data. Therefore a firm recommendation of the science panel is that the direction and requirements of the stock assessment process, through ASA models, should be clarified and evaluated as soon as possible.

We wish to further elaborate about why all the other herring projects are secondary in importance to stock abundance estimation. It is because much of the biology and life history of herring is impacted by density-dependent processes and this, in turn, can affect growth, maturation, migration, condition, disease and recruitment – all subjects of the proposals in the herring program. Herring abundance also affects other fauna, especially seabirds and marine mammals. Therefore, the science panel recommendation is that the assessment of herring abundance should get top priority, and proceed as vigorously and rapidly as possible. This is not to say that the other projects are unworthy or should stop - on the contrary. The assessment project, while vital, is among the most scientifically routine of the lot, because it involves the implementation of exiting protocols and methodologies. That does not mean it is simple or easy to do, but it is not a 'hypothesis testing' enterprise in the usual sense. Nevertheless, the products of assessments will provide a basis for better science for almost all of the other projects. The common element on all the other projects, with the possible exception of some acoustics projects, is that they aim to determine why and how herring populations change – physiologically or ecologically. In a sense their value is dependent on the rigor of the herring abundance assessments.

What are the implications of this recommendation?
(1) The project on ASA modeling work should be acknowledged as a priority (even a pre-requisite) among the other herring projects. It needs to be implemented rapidly because its requirements could impact that way that other projects develop, especially acoustic projects.

(2) The immediate implication is that the development of a functional herring ASA model should be proceeding much more rapidly than indicated in the progress report. If this task cannot be implemented in a timely manner, than the herring program should consider other ways of getting this work done.

(3) A longer-term implication is that some of the closely related projects that might provide input data to the ASA, especially some of the acoustic projects, could require modification or reconsideration. If the age-structured model cannot incorporate the acoustic data, as it is presently acquired, then the design of the acoustic programs should be adjusted and re-evaluated. However, this cannot be determined until the ASA model is functional and evaluated.

(4) Once the ASA model is functional, then it should be formally reviewed by 1-2 independent (outside) experts to evaluate its formulation, application and efficacy. Such a review is a common practice and should culminate in a report that

documents the review findings. This report would then provide direction about the data requirements for a reliable ASA model of PWS herring. (Note: this was a recommendation in the 2011 science panel report).

(5) If the fully-developed ASA model cannot provide acceptable results because of the limitations of the input data, then other approaches to herring biomass assessments must be considered. These could include simpler models that rely more directly on acoustics or spawn deposition.

HRM Program Team Lead Response:
We fully agree about the importance of the stock assessment model. Improving that capability is the goal of this program. ADF&G currently has an operational stock assessment model (ASA) that our modeling project has replicated in a form that can be run to determine the Bayesian statistics. The population modeling project is presently examining the value of each of the inputs into that model.

The expanded adult herring biomass surveys along with the proposed aerial survey proposal are designed specifically to improve the quality of the abundance assessments used as inputs to the model. As the Science Panel points out, they are not meant to be hypothesis driven, but are necessary for understanding how the population is changing. We continue to examine the assessment projects to determine if there are ways to make improvements to our approach and if other measures of abundance are more appropriate. The two longest time series of abundance measures/indices are the miles-days of spawn and the acoustic biomass estimates. We are working closely on the issue of how good these inputs are and we are reviewing other forms of input such as aerial biomass estimates and spawn deposition surveys used both in Alaska and elsewhere to determine if they are likely to be able to be implemented and would improve our abundance estimates. Both of the previously mentioned methods have been used in PWS and are being evaluated in the modeling project.

Since you mention the importance of the abundance assessments we hope that you support the addition of aerial surveys in this program. That project is limited and could be expanded if additional funding was available.

Answers to the specific recommendations follow:

1) The existing ASA model run by ADF&G is fully operational and central to the design of the HRM program. The projects addressing objective 1 of the HRM program are specifically designed around the needs of the existing model. The HRM program is looking at other methods of modeling the herring population.
2) Because there is a fully functional ASA model available to the program and we recognize the need to train future researchers, we chose to work this aspect of the program through a graduate student. This is a bit slower than putting a PI directly on the project, but that pace is necessary if the student is to be trained. That student has completed the development of a second fully

functional ASA model with features outside of that used by ADF&G. This project is on track with the original proposed timeline.

3) Both ASA models incorporate the adult biomass estimates that the acoustic project provides. The acoustic biomass estimates have been an input to the model since the late 1990s. We are researching the ability to use acoustic estimates of juvenile populations as inputs to the ASA model, but we are still determining how well we can provide an estimate of potential new recruitment.
4) The operational ASA model has been presented in peer-reviewed publications, which we feel meets the need for independent review. In essence our modeling project is designed to provide an independent review of the ADF&G ASA model and its inputs as you are recommending and was recommended earlier.
5) There will always be a question about what piece of information provides the best measure of herring biomass. Every one of the methods used to provide a measure of biomass has definite sampling issues. We agree that a simpler model may be as accurate as the present version of the ASA model. We will also be exploring more complex models that incorporates the information on life history determined by other projects in this program, such as the disease, energetics and growth projects

19. Inter-project cooperation and communication

The science panel acknowledges and salutes the efforts made to coordinate logistics of field projects, especially following a long period when PIs worked relatively independently on most projects. However we are not convinced that some of the individual projects are as well connected as they should be, in terms of communication among PIs. This comment is based on an apparent lack of connectivity among some of the proposals.

HRM Program Team Lead Response:
Meetings of the PIs within the program and with those of the Gulf Watch Alaska program are held regularly. What appears to be a lack of connection between proposals arises because the single original proposal has been split into several individual projects for your review rather than being presented as a single program. The single program cannot provide as much detail about individual components, and individual components don't show the connectivity of the program as a whole.

20. Project gap: microchemistry

The panel noted that the PWS herring population could have important spatial structure that might go undetected by genetic analysis of microsatellites. This could occur if PWS herring consist of a meta-population with spatially separate sub-populations that, nevertheless, have sufficient genetic exchange to preclude genetic detectable differentiation. Therefore it is important to re-examine this issue

because the previous genetic work, conducted more than a decade ago, had a short duration and a limited number of probes. Based on the previous genetic study in Prince William Sound, and similar but more recent genetic analyses of other herring populations in the eastern Pacific, the panel does not anticipate that the current genetic studies will demonstrate new evidence of genetic variation within PWS. Instead these studies will probably provide important confirmatory evidence of a lack of genetic differentiation detectable within different parts of the Sound. Such evidence, however, would not necessarily mean that PWS herring lack any spatial variation.

It is possible that PWS herring constitute a meta-population consisting of several sub-populations that may have spatially distinct life histories for parts of their lives. If so, these populations could have different growth rates, and population parameters. Knowledge of such possible spatial structure is integral to understanding factors affecting the abundance of PWS herring. The absence of such understanding represents an ongoing gap in the program. Such a gap could be addressed by analyses of microchemistry of otoliths. Time spent by herring in different bays within PWS and the surrounding region, could be reflected in the chemical composition of otoliths that can be detected by analyses of microchemistry. This approach would have linkages to several other projects. Thus, the microchemistry approach would provide helpful new insights to ongoing projects while improving linkages among them.

The panel is aware of difficulties associated with previous attempts to examine microchemistry of herring. We acknowledge that microchemistry must be used carefully as a research tool, but point out that it can be a powerful and informative approach when done properly. For this reason we suggest that the herring program could consider the incorporation of this approach. For technical reasons, explained below, we further suggest that the optimal approach would be the examination of otoliths.

Regarding scales vs. otoliths: Herring scales may not be a good tissue for microchemistry, but otoliths may be useful. The main problem with scales is that herring resorb calcium and other minerals from their scales as they mature sexually. The effect does not interfere with annulus formation on scales but it could confound comparisons of putative population groups. This is not a concern for otoliths where, in theory, the chemical signatures are retained unchanged with age/time. The main concern with otolith collections is that they need to be collected and stored carefully prior to analysis. As they dry, otoliths tend to develop hairline cracks that can accumulate extraneous material – which again can confound results.

Potential Resource - The current director of the UAF Alaska Stable Isotope Facility is Matt Woller. He is well respected and is an excellent collaborator. See: http://ine.uaf.edu/werc/asif/

HRM Program Team Lead Response:

This is one of many gaps in the program that we have identified. The program is designed to review and change focus with each 5-year proposal. As you mention, this technique has been applied to herring in PWS with some difficulty. We think it would be most appropriate as a component of a program that examines larval drift, which is one of the potential focal areas for the future. At this point we would prefer to see a small demonstration project funded to ensure we overcome the issues with the previous work. We have been retaining otoliths from the juvenile herring we collect so that we have samples to work with when we have the ability to fund this type of research, but want to also point out that otolith work can be expensive.

21. Forage Fish

The Science Panel supports the enhanced attention to estimating population abundances of important Forage fish in the Long-term Monitoring/Gulf Watch Project, while noting that the Herring Program will also be sampling forage fishes acoustically and during net tows, such as those planned to ground-truth acoustic signals. Except for herring itself, the early studies of EVOS impacts on the PWS ecosystem unfortunately failed to establish population assessment on any of the forage fishes of known significance to supporting higher-order predators: sand lance, capelin, and eulachon in particular. The Piatt project in LTM/Gulfwatch can serve as the centerpiece study of forage fish to which information gathered by PIs on other projects could be transferred to provide enhanced knowledge of abundances and dynamics of forage fishes.

LTM and HRM Program Team Lead Response: We agree about the importance of forage fish monitoring, and the Piatt project was included in the GWA program for that reason. We expect that the initial results of that project will lead to a fruitful discussion in advance of and during the joint Science Workshop.

This project is in close connection with the HRM program. We are working to find ways so that both programs fill gaps for the other program and ensure we have comparable results. Nearly identical equipment is being used by the forage fish and herring acoustics and validation projects. We are examining what new questions might be addressed by the temporal difference in sampling between the forage fish and herring projects. We have identified the need for additional support for aerial surveys, and would appreciate more discussion on this.

22. Bishop. Tracking Seasonal Movements of Adult Pacific Herring in Prince William Sound 14120111-B

Is there any identification of gender in fish upon tagging? If so, more information on male/female schooling/movement behaviors would be very useful to come out of this work.

The results of progress to date were helpful and interesting. Given that the application of the acoustic tag technology to herring appears to be successful, it would be useful to present future results in the context of testable hypotheses –

particularly regarding movements of herring into and out of Prince William Sound. Project Objective 2 is to monitor movement from overwintering to spawning grounds. While the shift from tagging from fall to spring appears to be well justified, the proposal should discuss how this affects achievement of Objective 2 and whether Objective 2 should be revised.

Potential Resource - Because of the departure of Sean Powers from his role as co-PI on this project, the project may need to add a co-PI with experience in acoustic tagging of fish. Several fish ecologists are now using this technology, including Joel Fodrie of UNC and Craig Layman of NC State University.

HRM Program Team Lead Response:
This project was designed as a proof of concept that has resulted in better than anticipated returns. The gender of the fish was identified during tagging. Objective 2 is unlikely to be achieved and the analysis is being revised. The shift in timing of the tagging allowed us to examine how long the fish remained near the spawning grounds (some for nearly two months) and determine when the fish leave and return to PWS. The change in timing shortened the duration that the tags needed to transmit to observe the movement out and into the Sound. The information from the acoustic arrays at the entrances was uploaded in early September and 41 of the 69 fish were observed at the entrances. There was a gap in time between detections and the fish were just starting to be detected again when the data was uploaded.

Since this was a demonstration project, it is now reaching its analysis phase. Dr. Bishop has been funded by NPRB to do other fish tagging work and has a technician with significant experience with acoustic tagging procedures. We feel we have enough expertise to complete the project as described, even without contributions from Dr. Powers.

<u>Re: Bishop – Validation of acoustic surveys using direct capture</u>

It seems that Dr. Bishop is performing a 'service' to the other PI's, but an essential one, especially in the collection of herring samples. For this service the Science Panel applauds her efforts. It would be useful to know, however, how much of the total effort is actually dedicated to acoustic work. This proposal contributes to the cumulative cost of acoustic work in Prince William Sound – so between the three proposals by PI Buckhorn, and this, the total annual effort and cost of acoustic work is significant. This may be appropriate if acoustics has a central role by providing key data for annual abundance estimates.

A general comment: The rationale for this proposal is to validate an acoustic target using a single beam sounder. This is valid in the context of the present program but there may be a more fundamental question that has not been addressed – although it is not directed specifically at this project. Is the acoustic equipment being used the best for the job? If acoustic estimates were used as the ASA tuning index, how would any change(s) in the acoustic surveys (survey protocols, or equipment) affect the

temporal integrity of the index? Similar questions were posed in the 2011 Science Panel report.

A different question: There is an interesting excerpt from the proposal: "We recognize that a major deficit in the existing PWS Herring Survey program is the lack of an effective means of validating the acoustic signal. Fortunately, if we can establish through direct capture of ensonified fish that certain patterns in echograms can be interpreted as different year classes of herring, then we may be able to reanalyze historical acoustic measurements to better understand changes in juvenile herring populations."

The suggestion above is that acoustic strength estimates, obtained by field measurements in from this project, could be used to adjust results from past herring surveys. It is not clear who would do this retrospective analysis. Regardless, such a contribution would be welcome - with the caveat that the rationale and methodology must be documented and accessible, preferably in a published report.

HRM Program Team Lead Response:
The acoustic program is dependent on direct capture to provide information about the organisms being ensonified to be able to convert the signal to a biomass measurement. The capture program also provides fish for the energetics and growth, disease prevalence, and genetics projects.

We have converted the technology from a single beam acoustic system to a split beam unit because we realized that the older unit was no longer the most appropriate technology. In theory this should not change the biomass estimate provided by the two units. The practicality is that the error margins on the acoustic estimate caused by survey error are much larger than those associated with the acoustic signal. The changes in survey protocols are something we are examining for their impact on our estimates of juvenile populations. We have not modified the protocols for adult surveys.

The retrospective analysis would be the responsibility of Buckhorn in the acoustic survey projects. The question at hand is if different portions of the pattern can be attributed to different fish assemblages. For instance, are age-0 herring found in schools in the top 15 meters only? We agree about the importance of getting peer reviewed methodology in place.

<u>23. Bochenek. Data Management 14120111-C *CONDITIONAL FUND</u>
*Also see Data Management, above.

Progress is listed as "Data is being archived on the Workspace by investigators in the program…" and "Data from the past two field seasons will be ingested into the data management system. We will continue to refine and expand the information available through the Herring data portal."

Please specify what data have been incorporated. Also, the demonstration of progress is not adequate. More detail is essential. Failing that, this project should be suspended. An inventory of all data proposed to be incorporated eventually into the program should be drawn up and an accounting of progress on incorporating the listed data sets should reported annually, including any changes to the inventory of target datasets.

HRM Program Team Lead Response:
The HRM Program data management approach differs from the LTM program in two respects: the program developed out of a group of earlier herring research projects funded by the EVOSTC, and it is more oriented to hypothesis-driven research than monitoring, with differing data needs.

Data produced from the original suite of herring projects, including the updated herring data acquired from ADF&G, are housed both on the Prince William Sound Herring Data Portal, which is hosted on the AOOS website http://data.aoos.org/maps/pwsherring/ and the AOOS Gulf of Alaska (GOA) portal. The goal is to completely integrate the Herring Data Portal into the overall GOA portal, using a specific tag in the search catalog for EVOSTC herring data and a tag for herring in general. Many ancillary data sets have been ingested and exposed through the AOOS GOA portal.

Project investigators are also using a private account on the AOOS Research Workspace, thus making their data available for synthesis and analysis activities prior to its eventual transition to the publicly accessible AOOS GOA Portal. The project profiles and file structure are still being further developed. Under the HRM program, data have been posted onto the Research Workspace on the following:

- Fish collection by community fishermen
- Aerial survey information
- Herring disease prevalence
- Physical oceanographic data
- Bird observations
- Herring energetics measurements

PIs have prepared additional acoustic survey data, merged the fish predation database, and developed summarizations of the aerial survey data. The zooplankton information has been completed and is ready for submission into the Research Workspace.

Appendix D to this report includes a table of herring data resources acquired and supported through this program and available on the HRM Research Workspace. This table does not include the data already available through the PWS Herring Data Portal or the AOOS Gulf of Alaska portal.

24. Branch. Population Dynamics Modeling 14120111-Q

While this effort may be in the correct direction, the estimation of herring biomass is an integral and very important part of the herring program. Candidly, the Science Panel had expected more progress and more effort than the efforts of a graduate student to be directed at this issue. This comment should not be seen as a criticism of the student, but instead as a deficiency in the effort directed at this important issue.

There is no indication from the proposal that there is any dialogue between the PI and the other herring program PIs and if so, that is a problem that should be addressed. A specific concern is the extent to which acoustic data, or acoustic indices, can be used, as a component of the annual assessments. Similar questions exist about the spawn data. It seems probable that some form of fisheries-independent index would be required to tune the age-structure (ASA) model. If not, then something else might be used, such as a spawn index and if so, that might require a reallocation of resources. Therefore a better understanding of the data requirements for practical development of the ASA model is required. To this end the modelers need to examine and evaluate the strengths and weaknesses of the available data, preferably in collaboration with other PIs in the herring program.

HRM Program Team Lead Response:
This program is on track with the original proposed schedule. Since there is an existing operational ASA model, we feel there is time to allow a student to be developed within this aspect of the program. By developing a new researcher we hope to bring greater focus to the project than can be achieved by the contributions of a PI, and recognize that the initial pace is slower. The current phase of the project is to examine and evaluate the strengths and weaknesses of the available data. We expect that phase will be completed before the start of the FY14 funding.

The modeling project is in communication with the PIs of this program and with ADF&G to understand issues associated with the field measurements. The modeling program has also contributed to development of a new approach to the overwintering energetics model. Those results are included in the final report by Dr. Kline from his PWS Herring Survey Project.

25. Buckhorn. Expanded adult herring surveys 14120111-E

If acoustic information is to be used for annual herring assessments (by ADFG or anyone else) then it would seem reasonable that there were some meaningful communication between the people doing the survey and those doing the assessments (see specific comments on the previous proposal).

Is there a data source, or database on areas that were 'historically surveyed'? If so, what or where is it? Will it be made available to the data synthesis projects? Has

there been any effort made to report on these data? Because of PI departures, a very junior, although promising scientist without any peer-reviewed publications, is left alone to execute this project. The Science Panel urges engagement of a more senior experienced partner to help guide and enhance this project.

It is gratifying to see that samples from Kayak Island were made available to geneticists. However, there does not appear to be any reference to this in the genetics proposal.

HRM Program Team Lead Response:
We are in regular communication with ADF&G about all phases of this program. The PWSSC acoustically derived adult biomass numbers have been incorporated into the ASA model since 1995. The data have been used by Dr. Thorne in publications related to PWS herring populations.

There are maps of the areas surveyed each year that show the shift from the Montague Island spawning grounds to the Port Gravina area. There is also a shift in timing of the spawn between the grounds. We are using that information along with ADF&Gs aerial surveys and reports from fishermen to determine the most appropriate time and location for the expanded surveys.

Dr. Thorne is still connected to the acoustic survey projects, albeit he is working hard to become fully retired. He continues to participate in the program in trying to ensure all his previous data is organized in a manner that is easily interpreted and providing expertise to Dr. Buckhorn. He spent the past three years working with Dr. Buckhorn to develop her skills. Dr. Buckhorn is an example of a post-doc transitioning into the program.

The Kayak Island samples were not part of the original proposal. They represent an opportunity to meet the needs of the genetics project, interests of local fishermen, and ADF&G's needs for additional information on that stock. They are meant to be an addition to the originally proposed work and an opportunity to have samples if we are unable to collect fish from multiple spawning stocks within PWS.

<u>26. Buckhorn. Intensive surveys of juvenile herring 14120111-F</u>

There is reference made to the assessment model but there is nothing in the new population dynamics proposal to indicate any meaningful communication between the acoustics work and the developing assessment models. Specifically, is it anticipated that data derived from acoustic surveys will be used as input to the assessment model? If so, it is important that there is an active dialogue among people working on inter-related projects.

This juvenile herring project is predicated on the assumption that it will provide a useful prediction of age-3 recruitment. If there were a commercial fishery this prediction could be especially useful but its value as a predictor would diminish if

commercial fisheries for herring were not re-established. In any event such a juvenile index could provide a measure of first year survival, or 'over-wintering' survival, and then this could be useful, especially to the projects concerned with disease and 'condition'.

Please clarify: will the survey design in 2014 match that in 2013? Again, Dr. Buckhorn and the project could benefit greatly by engaging a senior collaborator for this project.

HRM Program Team Lead Response:
This project is designed to develop an index for guiding the prediction of the incoming recruitment of age-3 herring in the ASA model. This need for a recruitment estimate is well established from the modeling aspect of the program, and the desire is to determine if we can improve the estimate using information from the acoustic surveys.

The survey design in 2014 will be the same as in 2013. We will need to reevaluate the design after this year because there are questions about the amount of time required to complete the survey.

27. Butters & Pegau. Outreach 14120111-H

Was there any attempt to coordinate output with Gulf monitoring group? As noted above, the science panel notes that there may be opportunities and requirements for increased communication among PI's within the herring project. A key point is how the different projects relate to each other, especially their connections or inter-dependences. This aspect was not well developed in this (2013) set of proposals. Perhaps this outreach project can assist in this regard?

HRM Program Team Lead Response:
We do compare efforts with the Gulf Watch Alaska group, and a PWSSC staff member serves on the GWA Outreach Advisory Group to help further those connections. We look to the GWA program for new opportunities for outreach, and the GWA program looks at the materials that have been developed for the herring projects in their selection of outreach efforts.

The communication between project PIs in the HRM program have focused on in-person annual PI meetings that are supplemented by a meeting scheduled during the Alaska Marine Science Symposium. We are looking at the GWA model of having quarterly teleconferences as a means to increase communication. We have developed a web diagram showing the connection between the PWS Herring Survey projects and can develop the same for the HRM project. These diagrams are too complex to be of much value for outreach to the general public, but we may be able to develop something simpler and more visual.

28. Guyon. Genetic stock structure 14120111-P

The investigators should re-examine their plans to ensure that the sites of proposed sampling match the broad objectives of the coordinated proposals. We suggest that the greatest value from this work would be a definitive evaluation of the genetic differentiation, or lack of it, within PWS and areas immediately adjacent, such as Kayak Island. It is not clear that one location east and one location west would satisfy questions about stock structure within PWS. If sample size is an issue, perhaps analyzing the samples from Yakutat has lower priority. The Science panel also wonders why there was no reference made to the samples collected from Kayak Island (were these samples of eggs or fish?). Inclusion of these samples would seem to be high priority.

Further, we advise that the investigators take adequate measures to ensure that they are examining fish in spawning condition. Alternately, if it were possible to conduct genetic analyses on late embryos (from spawn samples) as this might be a useful approach.

HRM Program Team Lead Response:
The biggest issue this project faces is the collection of fish from different spawning events. This past year there were large spawn events in the Port Gravina region, but very little reported elsewhere. When the additional spawning events are so small, it takes a lot of effort to be able to respond in a timely manner. This is one of the reasons for the requested aerial support for the program. The Kayak Island samples were not part of the original design because the collection of fish from that area had only happened once before and with great difficulty, so we did not anticipate the opportunity for additional collections. The collection used a very unorthodox method (the fish were found dead in tide pools on the reef), and we will see if additional fish can be collected in this manner using an aircraft. We are focusing our collection on fish that are actively spawning. We will ask the investigators if herring spawn can be used, as it is easier to identify and collect than the adult fish. Those investigators are unavailable to consult with at the time this response is being put together because of the federal government shutdown.

29. Heintz/Pegau. Overwintering, condition, intensive juvenile sampling proposals 14120111-M, 14120111-L

Considerable concern was expressed about the departure of Dr. Kline and the panel endorses Pegau's expressed urgency in finding a suitable replacement. These proposals tackle important issues and they both do a very good job of relating what they do to other projects, especially to the ASA model. These proposals also present well and respond to much of what the panel recommended in 2011.

Over-wintering mortality among herring juveniles has been invoked as an explanation for many things: recruitment variation, spatial variation in herring

survival and susceptibility to disease within Prince William Sound, and perhaps more. It is an important topic and there is a rich legacy of work on this by productive researchers in Prince William Sound. It is important that this work receive the continued attention it deserves, including as much synthesis of past work as possible.

With respect to the 2013 proposals: no plan is evident to examine the relationship of the change in energy content to climate and oceanographic conditions during the pre-sampling and overwintering periods. If PIs are truly interested in determining whether the "constraints" are relaxed, then all constraints, including climate/ocean factors must be considered.

As much as possible these projects must be integrated with oceanographic and biological data from LTM, especially because the causes for condition changes are crucial. The project must also be integrated with the herring disease program. The panel suggests that condition be used in experiments with disease challenges including transmission mechanisms.

HRM Program Team Lead Response:
Dr. Pegau also wants to ensure that a replacement for Dr. Kline is found as soon as possible. The rich amount of information of the overwintering energetics is being used to examine the role on survival and has been incorporated into some of the disease susceptibility research. The synthesis of the existing observation is critically dependent on being able to tie the energetic conditions to the oceanographic records. We are using meteorological, physical oceanographic, chlorophyll, and zooplankton information to examine the relationship between condition of herring and the environment. There is growing evidence (see herring scale growth project) that condition and growth may be a good predictor of an individual's ability to survive while being a poor predictor of recruitment. We still believe that there are connections between the oceanographic conditions and recruitment that are not evident from the condition and growth of the herring. One difficulty has been to clearly identify times of good recruitment outside of the four year cycles of the 1980s that may have been caused by herring life history rather than oceanographic conditions.

We believe that we have begun the effort to include condition in aspects of the disease research. One publication (Vollenwieder et al. 2011) looks specifically at the relationship between energetics and *Icthyophonus*:

> *Vollenweider, J. J., J. L. Gregg, R. A. Heintz, and P. K. Hershberger, 2011, Energetic cost of Ichthyophonus infection in juvenile pacific herring (clupea pallasii), Journal of Parasitology Research, doi: 10.1155/2011/926812.*

<u>30. Heinz & Vollenweider- Age at first spawning 14120111-J</u>

The progress report is very brief. Is this statement: "Histology can identify fish that have not previously spawned" based on the results of the analysis of this project or

from published papers on this topic? If the former it would be helpful to know more about the criteria used to differentiate between first-time and repeat spawners. Also, the ability to detect age at first spawning from changes in growth rate in field-caught specimens would be a significant breakthrough. However, the proposal does not articulate how age at first spawning would be determined and validated from older fish that had already spawned more than once.

HRM Program Team Lead Response:
Unfortunately, this team was in the field the month leading up to the reports being due and was unable to provide much additional detail. They are unavailable at this time due to the federal government shutdown. The understanding is that they have been using laboratory-reared herring to confirm the ability to detect if a fish has spawned using histological methods. They are attempting to use changes in herring growth based on the herring scales to determine if differences in growth due to energy allocation to reproductive organs can be observed in the scales of fish at the age of observed recruitment. We can provide more information once they are available.

31. Hershberger - Herring Disease Program (HDP) 14120111-K

The Science Panel feels that this is probably one of the most important high-payoff programs within EVOSTC. Funding needs to continue and the incorporation of disease ecology needs to be somehow incorporated into models.

HRM Program Team Lead Response:
At this point the ASA model has disease prevalence as a predictor of mortality. We recognize this is not likely to be the most appropriate application of the disease information, which is why the current focus is on methods to determine the susceptibility of the population.

32. Moffitt - Scales as growth history records 14120111-N

It is probable that the results of this project will provide new perspective about the biological changes that occurred in PWS herring in the mid-1990's. It is essential that the PI develop and explain some quality control rules (and report on them) to ensure that mismatches between the archived scales and size data do not confound the data or results. Also, Table 1 (cited in the text) was not provided.

HRM Program Team Lead Response:
There are several steps for quality control in the selection and scanning of scales. Because of these rules, the older scales have not been scanned. It has been found that the labeling of the older scales was not as easy to tie to the existing databases. A description of the quality control measures will be included in the final report. The missing table is Pegau's fault. It is provided below.

Table 1. Count of production Pacific herring scale images by collection year and count of measured scales by age, sex, and collection year.

		Measurements Count						
		Age 4		Age 5		Age 6		
Collection Year	Production Images count	Male	Female	Male	Female	Male	Female	Total
2012	186					20	17	37
2011	194					30	22	52
2010	193					26	26	52
2009	194					22	27	49
2008	191					30	24	54
2007	191					29	23	52
2006	187					32	27	59
2005	194					29	24	53
2004	174					21	21	42
2003	193					28	26	54
2002	188	31	30	34	27	30	32	184
2001	186	34	31	29	32	30	28	184
2000	188	27	35	39	30	35	36	202
1999	183					27	29	56
1998	181					25	28	53
1997	181					30	30	60
1996	182					27	29	56
1995	183					30	31	61
1994	183					28	27	55
1993	177					24	28	52
1992	164					12	22	34
1991	170					29	27	56
1990	131					23	33	56
1989	183					29	27	56
1988	125					26	31	57
1987	182					29	29	58
1986	180							
1985	99							
Totals	4,963	92	96	102	89	701	704	1,784